
Optični spojni elementi in pasivne komponente - Izvedbeni standard - 081-03. del: Električno krmiljeni spremenljivi optični atenuator srednje obsežne naprave 1 x N DWDM brez konektorjev za enorodovna vlakna kategorije OP - Zunanje zaščiteno okolje

Fibre optic interconnecting devices and passive components - Performance standard - Part 081-03: Non-connectorized single-mode fibre optic middle-scale 1 x N DWDM devices for category OP - Outdoor protected environment

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Dispositifs d'interconnexion et composants passifs fibroniques - Norme de performance - Partie 081-03: Dispositifs DWDM 1 × N de milieu d'échelle à fibres optiques unimodales, non connectés, pour la catégorie OP - Environnement extérieur protégé

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IEC SC 86B : FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS	
SECRETARIAT: Japan	SECRETARY: Mr Shigeru Tomita
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TITLE:

Fibre optic interconnecting devices and passive components – Performance standard - Part 081-03: Non-connectorized single-mode fibre optic middle-scale 1 x N DWDM devices for category OP – Outdoor protected environment

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22 INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**FIBRE OPTIC INTERCONNECTING DEVICES
AND PASSIVE COMPONENTS –
PERFORMANCE STANDARD –**

**Part 081-03: Non-connectorized single-mode fibre optic middle-scale
1 × N DWDM devices for category OP – Outdoor protected environment**

FOREWORD

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International Standard IEC 61753-081-03 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

The text of this standard is based on the following documents:

FDIS	Report on voting
86B/xx/FDIS	86B/xxx/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

- 74 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.
- 75 A list of all parts of IEC 61753 series, published under the general title *Fibre optic*
76 *interconnecting devices and passive components performance standard*, can be found on the
77 IEC website.
- 78 The committee has decided that the contents of this publication will remain unchanged until
79 the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data
80 related to the specific publication. At this date, the publication will be
- 81 • reconfirmed,
 - 82 • withdrawn,
 - 83 • replaced by a revised edition, or
 - 84 • amended.
- 85

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 081-03: Non-connectorized single-mode fibre optic middle-scale 1 × N DWDM devices for category OP – Outdoor protected environment

1 Scope

This part of IEC 61753 contains the minimum initial test and measurement requirements and severities which a fibre optic middle-scale $1 \times N$ ($16 \leq N \leq 64$) DWDM (dense wavelength division multiplexing) arrayed waveguide grating device with channel spacing of 50 GHz, 100 GHz or 200 GHz needs to satisfy in order to be categorized as meeting the requirements of category OP (outdoor protected environment). The requirements are given for the DWDM devices with Gaussian passband profile and flat-top passband profile. The requirements exclude the devices with dynamic electrical temperature control.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-2-50, *Optical fibre cables – Part 2-50: Indoor cables – Family specification for simplex and duplex cables for use in terminated cable assemblies*

IEC 61300 (all parts), *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures*

IEC 61300-1, *Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 1: General and guidance*

IEC 61300-2-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-1: Tests – Vibration (sinusoidal)*

IEC 61300-2-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre or cable retention*

IEC 61300-2-5, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-5: Tests – Torsion*

IEC 61300-2-9, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-9: Tests – Shock*

IEC 61300-2-14, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-14: Tests – High optical power*

IEC 61300-2-17, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-17: Tests – Cold*

- 126 IEC 61300-2-18, *Fibre optic interconnecting devices and passive components – Basic test*
127 *and measurement procedures – Part 2-18: Tests – Dry heat*
- 128 IEC 61300-2-22, *Fibre optic interconnecting devices and passive components – Basic test*
129 *and measurement procedures – Part 2-22: Tests – Change of temperature*
- 130 IEC 61300-2-26, *Fibre optic interconnecting devices and passive components – Basic test*
131 *and measurement procedures – Part 2-26: Tests – Salt mist*
- 132 IEC 61300-2-27, *Fibre optic interconnecting devices and passive components – Basic test*
133 *and measurement procedures – Part 2-27: Tests – Dust – Laminar flow*
- 134 IEC 61300-2-42, *Fibre optic interconnecting devices and passive components – Basic test*
135 *and measurement procedures – Part 2-42: Tests – Static side load for connectors*
- 136 IEC 61300-2-44, *Fibre optic interconnecting devices and passive components - Basic test and*
137 *measurement procedures - Part 2-44: Tests - Flexing of the strain relief of fibre optic devices*
- 138 IEC 61300-2-46, *Fibre optic interconnecting devices and passive components – Basic test*
139 *and measurement procedures – Part 2-46: Tests – Damp heat, cyclic*
- 140 IEC 61300-3-2, *Fibre optic interconnecting devices and passive components – Basic test and*
141 *measurement procedures – Part 3-2: Examinations and measurements – Polarization*
142 *dependence of attenuation in a a single-mode fibre optic device*
- 143 IEC 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and*
144 *measurement procedures – Part 3-6: Examinations and measurements – Return loss*
- 145 IEC 61300-3-20, *Fibre optic interconnecting devices and passive components – Basic test*
146 *and measurement procedures – Part 3-20: Examinations and measurements – Directivity of*
147 *fibre optic branching devices*
- 148 IEC 61300-3-28, *Fibre optic interconnecting devices and passive components – Basic test*
149 *and measurement procedures – Part 3-28: Examinations and measurements – Transient loss*
- 150 IEC 61300-3-29, *Fibre optic interconnecting devices and passive components – Basic test*
151 *and measurement procedures – Part 3-29: Examinations and measurements – Measurement*
152 *techniques for characterizing the amplitude of the spectral transfer function of DWDM*
153 *components*
- 154 IEC 61300-3-32, *Fibre optic interconnecting devices and passive components – Basic test*
155 *and measurement procedures – Part 3-32: Examinations and measurements – Polarization*
156 *mode dispersion measurement for passive optical components*
- 157 IEC 61300-3-38, *Fibre optic interconnecting devices and passive components – Basic test*
158 *and measurement procedures – Part 3-38: Examinations and measurements – Group delay,*
159 *chromatic dispersion and phase ripple*
- 160 IEC 61753-1, *Fibre optic interconnecting devices and passive components - Performance*
161 *standard - Part 1: General and guidance*
- 162 IEC 61753-081-02, *Fibre optic interconnecting devices and passive components performance*
163 *standard – Part 081-02: Non-connectorized single-mode fibre optic middle-scale 1 × N DWDM*
164 *devices for category C – Controlled environments*
- 165 IEC 62074-1, *Fibre optic WDM devices – Part 1: Generic specification*

166 IEC TS 62627-09, *Fibre optic interconnecting devices and passive components - Vocabulary*
 167 *for passive optical devices*

168 3 Terms and definitions

169 For the purposes of this document, the terms and definitions given in IEC 61753-081-02, IEC
 170 62074-1 and IEC TS 62627-09, apply.

171 ISO and IEC maintain terminological databases for use in standardization at the following
 172 addresses:

- 173 • IEC Electropedia: available at <http://www.electropedia.org/>
- 174 • ISO Online browsing platform: available at <http://www.iso.org/obp>

175 4 Test

176 Unless otherwise specified, all test methods shall be in accordance with the IEC 61300 series.
 177 The samples shall be terminated onto single-mode fibres as per IEC 60793-2-50 category B-
 178 652.B, B-652.D or B-657 in either coated fibres (primary and secondary) or reinforced cable
 179 format as per IEC 60794-2-50. DWDM devices used for the test are intended to be previously
 180 unstressed new samples but may also be selected from previously used samples, if desired.
 181 All measurements shall be carried out at the standard atmospheric condition defined in IEC
 182 61300-1, unless otherwise stated. If the device is provided with temperature control, this shall
 183 be set at the set-point specified by the manufacturer.

184 The requirements apply to every combination of input and output port.

185 All tests shall be carried out to validate performance over the required operating wavelength
 186 range. As a result, single or multiple spectral bands may be chosen for the qualification and
 187 differing target specifications may be assigned to each spectral band.

188 The following Table 1 is intended to provide guidance on the wavelength ranges of the
 189 various spectral bands. It is not intended for specification. Values of operating wavelength
 190 used in performance verification shall be defined in the manufacturer's specification.

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Table 1 – Single-mode spectral bands

Band	Descriptor	Range nm
O-band	Original	1 260 to 1 360
E-band	Extended	1 360 to 1 460
S-band	Short wavelength	1 460 to 1 530
C-band	Conventional	1 530 to 1 565
L-band	Long wavelength	1 565 to 1 625
U-band	Ultralong wavelength	1 625 to 1 675
SOURCE ITU-T G-series Recommendations – Supplement 39, Optical system design and engineering considerations		

193 5 Test report

194 Fully documented test reports and supporting evidence shall be prepared and be available for
 195 inspection as evidence that the tests have been carried out and complied with.

196 **6 Performance requirements**197 **6.1 Reference components**

198 The testing for these devices does not require the use of reference components.

199 **6.2 Dimensions**200 Dimensions shall comply with either an appropriate IEC interface standard or with those given
201 in appropriate manufacturers drawings, where the IEC interface standard does not exist or
202 cannot be used.203 **6.3 Test details and requirements**204 The requirements are given only for pigtailed DWDM devices. For connectorized components,
205 the connector performances shall be in compliance with IEC 61753-1.206 The minimum length of fibre or cable of 1,0 m per port on each pigtailed side shall be used for
207 all tests.208 Test details and minimum requirements for category OP is shown in Table 2, Table 3 and
209 Table 4.210 **Table 2 – Test details and requirements for type A (Gaussian passband profile)**

No	Tests	Requirements	Details	
1A	Number of channels: N	$16 \leq N \leq 64$	Operating wavelength: NOTE	ITU-T grid (ITU-T Recommendation G.694.1) or custom design Design information (not test item)
2A	Channel frequency range	Channel central frequency $\pm 0,125 \times \Delta f$ where Δf is the channel spacing	Channel central frequency: NOTE	ITU-T grid (ITU-T Recommendation G.694.1) or custom design Design information (not test item)
3A	Attenuation (Insertion loss) IEC 61300-3-29	$\leq 6,0$ dB (channel spacing with 50 GHz) $\leq 4,5$ dB (channel spacing with 100 GHz, 200 GHz) Maximum allowable attenuation (Insertion loss) over the channel frequency range	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 0,2 dB The attenuation (Insertion loss) is determined as the maximum value over all states of polarization
4A	Channel non-uniformity IEC 61300-3-29	$\leq 1,5$ dB Maximum allowable channel non-uniformity of attenuation	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 0,2 dB The channel non-uniformity is determined as the maximum value over all states of polarization
5A	1 dB passband width IEC 61300-3-29	$\geq 0,25 \times \Delta f$ where Δf is the channel spacing. Minimum allowable 1 dB passband width (centred at the channel frequency)	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m $0,01 \times \Delta f$ The 1 dB passband width is determined as the minimum value over all states of polarization

Table 2 (continued)

No	Tests	Requirements	Details	
6A	3 dB passband width IEC 61300-3-29	$\geq 0,4 \times \Delta f$ where Δf is the channel spacing (channel spacing with 200 GHz) $\geq 0,5 \times \Delta f$ where Δf is the channel spacing (channel spacing with 50 GHz, 100 GHz) Minimum allowable 3 dB passband width (centred at the channel frequency)	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m $0,01 \times \Delta f$ The 3 dB passband width is determined as the minimum value over all states of polarization
7A	Passband ripple IEC 61300-3-29	$\leq 1,5$ dB Maximum attenuation variation within the channel frequency range	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 0,2 dB The passband ripple is determined as the maximum value over all states of polarization.
8A	Adjacent channel crosstalk IEC 61300-3-29	≤ -25 dB Maximum allowable adjacent channel crosstalk over the channel frequency range	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 1 dB The adjacent channel crosstalk is specified only for demultiplexer. The adjacent channel crosstalk is determined as the maximum value over all states of polarization
9A	Non-adjacent channel crosstalk IEC 61300-3-29	≤ -30 dB Maximum allowable non-adjacent channel crosstalk over the channel frequency range	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 1 dB The non-adjacent channel crosstalk is specified only for demultiplexer. The non-adjacent channel crosstalk is determined as the maximum value over all states of polarization
10A	Total channel crosstalk IEC 61300-3-29	≤ -20 dB Maximum allowable total channel crosstalk value	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 1 dB The total channel crosstalk is specified only for demultiplexer. The total channel crosstalk is determined as the maximum value over all states of polarization
11A	Polarization dependent loss (PDL) IEC 61300-3-2	$\leq 0,75$ dB Maximum allowable PDL over the channel frequency range	Launch fibre length: Measurement uncertainty: NOTE	$\geq 2,0$ m 0,10 dB The allowable PDL combination applies to all combination of input and output ports